PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B67D 5/56 | A1

(11) International Publication Number: WO 96/01227

(43) International Publication Date: 18 January 1996 (18.01.96)

(21) International Application Number: PCT/US95/05932

(22) International Filing Date: 12 May 1995 (12.05.95)

(30) Priority Data:
08/271,417 6 July 1994 (06.07.94) US

(71) Applicant: ECOLAB INC. [US/US]; Ecolab Center, Saint Paul, MN 55102 (US).

(72) Inventors: THOMAS, John, E.; 1091 E. Hazel Street, River Falls, WI 54022 (US). BOCHE, Daniel, K.; 611 Sally Circle, Eagan, MN 55121 (US).

(74) Agent: DAIGNAULT, Ronald, A.; Merchant, Gould, Smith, Edell, Welter & Schmidt, P.A., 1000 Norwest Center, 55 East Fifth Street, St. Paul, MN 55101 (US).

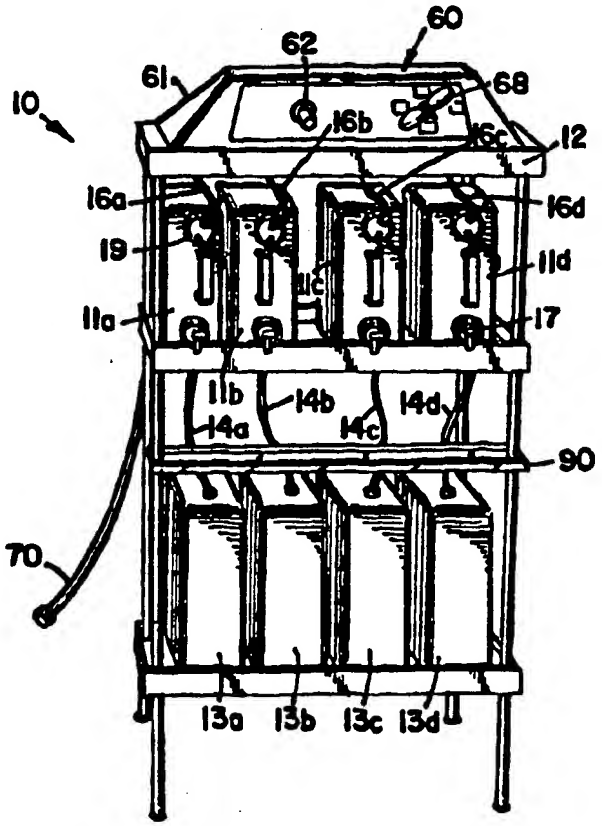
(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).

Published
With international search report.

(54) Title: METHOD AND APPARATUS FOR STORING AND DISPENSING CHEMICAL SOLUTIONS

(57) Abstract

A solution storage and dispensing apparatus and method of operation therefor are disclosed. The solution storage and dispensing apparatus includes a selector valve (68) and a control valve (62) which selectively output a liquid such as water to one of a plurality of storage containers (11a, 11b, 11c, 11d). Each container (11) has an aspirator (26) mounted therein which receives the water and a chemical concentrate to form a solution therein. A container is filled by selecting the container using the selector valve and actuating the control valve to dispense water to the selected container.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GB**	United Kingdom	**MR**	Mauritania
AU	Australia	**GE**	Georgia	**MW**	Malawi
BB	Barbados	**GN**	Guinea	**NE**	Niger
BE	Belgium	**GR**	Greece	**NL**	Netherlands
BF	Burkina Faso	**HU**	Hungary	**NO**	Norway
BG	Bulgaria	**IE**	Ireland	**NZ**	New Zealand
BJ	Benin	**IT**	Italy	**PL**	Poland
BR	Brazil	**JP**	Japan	**PT**	Portugal
BY	Belarus	**KE**	Kenya	**RO**	Romania
CA	Canada	**KG**	Kyrgystan	**RU**	Russian Federation
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CG	Congo			**SE**	Sweden
CH	Switzerland	**KR**	Republic of Korea	**SI**	Slovenia
CI	Côte d'Ivoire	**KZ**	Kazakhstan	**SK**	Slovakia
CM	Cameroon	**LI**	Liechtenstein	**SN**	Senegal
CN	China	**LK**	Sri Lanka	**TD**	Chad
CS	Czechoslovakia	**LU**	Luxembourg	**TG**	Togo
CZ	Czech Republic	**LV**	Latvia	**TJ**	Tajikistan
DE	Germany	**MC**	Monaco	**TT**	Trinidad and Tobago
DK	Denmark	**MD**	Republic of Moldova	**UA**	Ukraine
ES	Spain	**MG**	Madagascar	**US**	United States of America
FI	Finland	**ML**	Mali	**UZ**	Uzbekistan
FR	France	**MN**	Mongolia	**VN**	Viet Nam
GA	Gabon				

METHOD AND APPARATUS FOR STORING AND DISPENSING CHEMICAL SOLUTIONS

Field of the Invention

The present invention relates generally to a solution dispensing system, and more particularly to a solution dispensing system in which a liquid such as water is selectively dispensed to a plurality of containers for forming chemical solutions therein.

Background of the Invention

In janitorial settings which require a significant amount and number of specialized cleaning solutions, the liquid cleaning products are typically purchased on a concentrated basis, and then are diluted to the proper strength at the site where they will be used. This type of general system is employed by a wide variety of users, e.g., hotels, hospitals, restaurants, etc. Several dispensing systems have been developed for mixing and diluting the concentrated cleaning products. The dispensers usually feature at least some of the following components: a container for the concentrated cleaning product, a storage container for the diluted cleaning product, a method to dose concentrate into the storage container, and a water supply line to dilute the concentrate.

The dispensing systems cover a wide range in terms of their complexity. That is, the method of dilution may be rather simple and manual in nature, but requires a great deal of operator experience. On the other hand, the dispensing systems may be quite complex, requiring several mechanical devices to dilute the concentrates. Such complex systems are often necessary where different cleaning products and different dilution ratios are utilized for different cleaning applications. These dispensing systems typically require several separate water lines, each water line corresponding to a different type of cleaning concentrate. The requirement of multiple water lines also greatly limits the

locations at which the dispensing systems can be placed, and such systems are generally not portable. Accordingly, solution containers such as spray bottles and mop buckets typically must be filled and taken to the point of usage by the janitorial personnel.

The cost of these conventional dispensing stations is typically relatively high, because of their complexity and because backflow preventers are generally required for each water connection by applicable plumbing codes, and pressure regulators are necessary to control use solution concentrations within an acceptable range. Other necessary flow control devices also add to the cost of conventional dispensing systems; for example, a pick-up probe and foot valve must be employed in order to withdraw the concentrate from a rigid container.

One type of system which offers significant improvements over many of the more complex conventional systems is disclosed in U.S. Patent No. 5,255,820 issued to Thomas. To the extent necessary to support this disclosure, the disclosure of this reference is incorporated by reference herein.

The system disclosed in Thomas includes a number of solution storage containers and concentrate containers preferably arranged on a rack. One or more aspirators are mounted to the rack, and the storage and concentrate containers may be individually connected to the aspirators through quick release connections. A diluent such as water is provided through a gun assembly which may be attached to a water inlet port of the aspirator through a releasable, quick connection fitting. When it is desired to fill a storage container with a solution, the appropriate storage container and concentrate container lines are connected to the aspirator, and then the gun assembly is connected to the aspirator and actuated to dispense water or other diluent through the aspirator and into the storage container. By virtue of

the vacuum created in the aspirator, a controlled quantity of concentrate is also drawn into the storage container to form the solution.

This system offers significant advantages over other conventional systems as it is capable of providing controlled concentrations of solutions in a simple, easy and cost effective manner. However, while the quick release fittings between the various components of the system are comparatively easy to operate, selection of different storage containers and/or concentrates requires individual fluid lines to be rerouted between the storage and concentrate containers and the aspirators.

Another system which offers significant improvements over more complex conventional solution storage and dispensing systems is disclosed in U.S. Pat. No. 5,033,649, issued to Copeland et al. To the extent necessary to support this disclosure, the disclosure of this reference is also incorporated by reference herein.

Copeland et al. discloses a chemical solution dispensing and handling system which includes a storage container having an aspirator or other proportioning means disposed inside the container. Quick release fittings are provided to the aspirator to connect the lines running from a water source and a source of concentrate. The Copeland et al. system also provides for controlled concentrations of solution through the use of metering tips in the aspirator which control the respective flow rates of the water and concentrate.

The Copeland et al. device also offers the advantage of being simple, inexpensive and reliable. In particular, the container may be filled with solution merely by controlling the flow of water or diluent into the aspirator. However, each Copeland et al. system stores a single solution in a single storage container, thus requiring a plurality of such systems to provide a

plurality of chemical solutions. Also, selection of the system to fill often requires rerouting of a transferrable water line to the system.

Summary of the Invention

The invention addresses these and other problems associated with the prior art in providing a solution storage and dispensing apparatus for forming solutions in a plurality of storage containers using a single dispenser to selectively direct a first liquid such as water to each of the storage containers for forming solutions therein. In a preferred embodiment, an aspirator disposed in each of the storage containers draws a second liquid such as a concentrate into the storage container in response to the flow of the first liquid through the aspirator to provide a controlled concentration of solution in the container. A container is filled with solution by selecting the container to be filled through a selector valve, then actuating a control valve to dispense the first liquid through the aspirator of the selected container to draw in the second liquid and thereby form a solution. In this manner, a plurality of storage containers may be filled through a single connection to a source of first liquid.

In accordance with one aspect of the invention a solution storage and dispensing apparatus is provided which includes first and second containers, each having first and second inlet ports for receiving first and second liquids from first and second liquid sources, respectively, a selector valve having an input and first and second outputs, and a control valve, in fluid communication with the first liquid source, for selectively controlling the flow of the first liquid to the selector valve. The first and second inlet ports of each container are in fluid communication with a proportioning means, outletting into the container, for proportioning the relative flow rates through the first

and second inlet ports. The first and second outputs of the selector valve are in fluid communication with the first inlet ports of the first and second containers, respectively. The selector valve is selectable between first and second positions for placing its input in fluid communication with the first and second outputs, respectively.

In accordance with a further aspect of the invention, a method for filling containers is provided. The method includes the steps of providing a plurality of containers, each having first and second inlet ports for receiving first and second liquids from first and second liquid sources, respectively, selecting one of the containers to fill by selecting one of a plurality of positions of a selector valve having an input and a plurality of outputs, at least a portion of which are in fluid communication with the first inlet ports of the containers, and actuating a control valve disposed in fluid communication between the first liquid source and the input of the selector valve to dispense the first fluid through the selector valve and thereby dispense the first and second fluids into the selected container. The first and second inlet ports of each container are in fluid communication with a proportioning means, outletting into the container, for proportioning the relative flow rates through the first and second inlet ports.

In accordance with an additional aspect of the invention, an apparatus for dispensing a first liquid from a first liquid source to one of a plurality of containers is provided. Each container is of the type for storing a solution including the first liquid and a second liquid from a second liquid source, and each has first and second inlet ports for receiving the first and second liquids, respectively. The apparatus includes a selector valve having an input and a plurality of outputs. Each output is in fluid communication with the

first inlet port of one of the containers, and the selector valve is selectable between a plurality of positions to select one of the containers to fill by placing the input of the selector valve in fluid communication with one of the outputs. The apparatus also includes a control valve, in fluid communication with the first liquid source, for selectively controlling the flow of the first liquid from the first liquid source to the selector valve such that when the control valve is actuated, the first liquid is directed to the selected container to mix with the second liquid and form a solution in the container.

These and other advantages and features which characterize the invention are pointed out with particularity in the claims annexed hereto and forming a part hereof. However, for a better understanding of the invention, its advantages and objectives obtained by its use, reference should be made to the Drawing which forms a further part hereof and to the accompanying descriptive matter, in which there is described a preferred embodiment of the invention.

Brief Description of the Drawing

FIGURE 1 is a functional block diagram of a solution storage and dispensing apparatus consistent with the invention.

FIGURE 2 is a perspective view of the solution storage and dispensing apparatus of Fig. 1.

FIGURE 3 is a perspective view of one of the storage containers shown in Figs. 1 and 2, with a portion thereof partially cut away.

FIGURE 4 is a perspective view of the dispenser shown in Figs. 1 and 2, with the housing thereof shown in phantom.

Detailed Description of the Preferred Embodiment

Turning to the Figs., wherein like parts are denoted by like numbers throughout the several views, Fig. 1 shows a preferred solution storage and dispensing apparatus 10. While the apparatus as disclosed herein is for use with storing and dispensing cleaning products for use by institutional users such as hotels, hospitals, restaurants, etc., it will be appreciated by one skilled in the art that the principles of the invention may be applied to other applications in which there is a need for a cost effective, reliable, and simple system for directing a liquid to a plurality of dispensing points. Therefore, the discussion below regarding the use of the invention in conjunction with dispensing cleaning solutions is provided merely for the purpose of illustration.

Fig. 1 shows a preferred solution storage and dispensing apparatus 10 for selectively filling four storage containers 11a, 11b, 11c, and 11d with diluted solutions. Each container preferably includes an aspirator or other proportioning means 26 to control the concentration of the solutions formed in the individual containers. As discussed in greater detail below, aspirators 26 may be internal or external to the respective containers, and they may include metering tips or other similar components to facilitate the regulation of solution concentrations in the containers.

Containers 11a-d are configured to receive first liquids through lines 16a-d and second liquids through lines 14a-d. The first and second liquids are proportioned by means of aspirators 26 to form solutions in the containers.

The first liquid is preferably water or another diluent. However, it will be appreciated that many types of liquids may be used consistent with the invention.

The second liquid is preferably a cleaning concentrate which is diluted by the first liquid in the resulting solution. Examples of the types of cleaning concentrates utilized with the preferred embodiment of the invention are: multi-purpose cleaners, e.g., for walls, windows, tile and hard surfaces; germicidal detergents for disinfecting and sanitizing; floor care products; and specialty products for special cleaning needs. However, it is to be understood that the present invention is not to be limited for use only with cleaning products, but can be utilized to store and dispense any type of solution. Further, liquids other than concentrates may also be utilized consistent with the invention.

It will be appreciated that while four storage containers 11a-d are shown in the preferred embodiment, any number of such containers may be provided consistent with the present invention. For example, as few as two containers may be used.

Each storage container 11a-d is placed in fluid communication with a corresponding concentrate container 13a-d through one of lines 14a-d, to provide a source of a second liquid such as a cleaning concentrate for forming a diluted cleaning solution. It will be appreciated that more than one container 11a-d may be connected to a concentrate container 13a-d, and that more than one concentrate may be supplied to each container 11a-d. Furthermore, containers 11a-d are also in fluid communication with a first liquid dispenser 60 through lines 16a-d to receive a first liquid such as water from a first liquid source (e.g., a water supply).

Dispenser 60 preferably receives water from water source 100 through line 70. Water source 100 typically provides water at a pressure in the range of 30 to 70 psi, preferably in the range of 40 to 50 psi. It will be appreciated that a pressure regulator or other

components may be required to regulate the water pressure accordingly.

A control valve 62 is connected to line 70, and is preferably configured to provide bistable operation (i.e., the valve is either fully open or fully closed). However, it will be appreciated that a variable valve could also be used consistent with the invention.

A vacuum breaker 66 is preferably connected to control valve 62 through line 65. Vacuum breaker 66 operates as a back flow preventer, which is required by many plumbing codes, although vacuum breaker 66 is not required for the proper operation of the invention.

A selector valve 68 is connected to vacuum breaker 66 through line 67. Selector valve 68 is selectable between a plurality of positions. Selector valve 68 includes an input and a plurality of outputs, and the selector valve is configured such that one of the outputs is placed in fluid communication with the input in each of the plurality of positions of the valve. The outputs are in turn connected to containers 11a-d through lines 16a-d. Therefore, the container 11a-d to be filled is selected by selecting the corresponding position of selector valve 68.

It will be appreciated that one or more additional outputs may be provided on selector valve 68 so that water may be supplied directly to an output faucet, hose or other type of discharge port to provide, for example, a source of rinse water. Furthermore, it will be appreciated that the operation of selector valve 68 may alternatively be performed by separate valves. However, it has been found that the use of separate valves is more complex and expensive given that more components are required, and also that some form of mechanical lock out mechanism would typically be required to prevent the actuation of two outputs at once. This may be important since actuating two outputs at once may not provide

sufficient water pressure to adequately control the concentration of the resulting solutions.

The solution storage and dispensing apparatus 10 is preferably operated as follows. Suitable concentrates are provided in concentrate containers 13a-d, and the apparatus is connected to a suitable water source through line 70. Next, the container to be filled with solution is selected by selecting the corresponding position of selector valve 68. Then, control valve 62 is actuated to dispense the water to the selected container, whereby passage of the water through the aspirator draws the corresponding concentrate into the container to form the resulting solution. Once a sufficient amount of solution has been formed in the container, further dispensing is terminated by closing control valve 62.

Several advantages are realized by preferred apparatus 10. In particular, the apparatus is significantly easier to operate than many conventional systems since, once the water line and respective concentrate containers are connected to the apparatus, a container may be filled with solution merely by selecting the proper container with the selector valve, then actuating the control valve to dispense the solution. Unlike prior systems, there is no need to connect individual lines or gun assemblies to the individual containers or aspirators each time a solution is dispensed.

Furthermore, by providing individual aspirators for each container, there is no need to reconfigure a single aspirator to dispense different solutions in different containers. Also, by including individual aspirators, the respective flow rates can be optimized for each solution to be dispensed. In addition, there may be a significant space saving insofar as the aspirators may be provided within each of the storage containers.

Providing individual aspirators also reduces cross-contamination between solutions. In many conventional systems, water is directed to a single aspirator, and a concentrate dispenser is utilized to provide different concentrates to the common aspirator. Different concentrates are dispensed through a single channel, which allows mixing and contamination to occur between solutions. On the other hand, the preferred apparatus reduces or eliminates cross-contamination because the water, and not the concentrate, is selectively dispensed, and because individual aspirators are used on each container.

The preferred apparatus also is significantly less complex and expensive than many conventional systems. For example, only one water line and back flow preventer is required to fill a plurality of storage containers. To this extent, the invention provides a substantially portable and stand alone system whereby only one external connection (which is preferably to a water supply) is required to operate the system. Preferably, the control valve and selector valve require no electrical connections to operate, and therefore no separate electrical source is required to operate the system. In addition, the preferred apparatus is substantially modular, allowing a wide variety of types of solutions to be stored and dispensed in a single system.

Furthermore, the preferred apparatus is relatively safe and clean, as it is substantially closed to reduce splashing and spilling of the solution. This may be particularly important when the solutions involved are caustic or dangerous in that the exposure of operators to the concentrates and solutions thereof is minimized.

One physical embodiment of the preferred storage and dispensing apparatus of Fig. 1 is shown in Fig. 2. The apparatus 10 is preferably supported by a rack or

cart 12 which may be supported on wheels (not shown) so as to allow the cart assembly to be moved as necessary after disconnection from the water supply line 70. The apparatus 10 includes the containers 13a-d for the concentrated solutions. The rack 12 also supports storage containers 11a-d which store the diluted cleaning products or solutions. The containers 11a-d have a spigot 17 which can be opened for filling spray bottles (not shown) which are supported upon a shelf 90. The containers 11a-d are preferably approximately three to five gallons in size.

In the preferred embodiment, the product concentrates are supplied from containers 13a-d. Cart 12 may be configured to accommodate a plurality of these containers, as illustrated in Fig. 2. Containers 13a-d preferably are rigid containers, and the ends of pick-up tubes 14a-d connected thereto are provided with suitable pick-up probes and foot valves (not shown) which allow venting to equalize pressure. Alternatively, containers 13a-d may be collapsible, bladder type packages or containers which collapse as concentrate is withdrawn therefrom. With this alternate type of container, the pick-up tubes 14a-d would typically be attached to apertures in the bladder bags by means of threaded connections.

Fig. 3 shows one of the preferred storage containers 11a in which the diluted cleaning product or other solution is stored before dispensing. As discussed above, pick-up tube 14a transports concentrate into the container 11a. Further, water supply line 16a is received from dispenser 60, and it provides a conduit for water or another type of diluent into container 11a.

The water is mixed with the concentrate and the diluted product is stored within container 11a. That is, the concentrated product conduit 14a and line 16a feed into the storage container or jug 11a so that the container 11a contains the diluted cleaning product.

The container 11a is preferably approximately three to five gallons in size. However, it will be appreciated that various different sizes and shapes of containers may alternatively be used.

Container 11a has a spigot 17 from which the cleaning solution can be dispensed into spray bottles or other containers (not shown). The storage container 11a holds the use solution so that the spray bottles can be easily filled without the necessity of activating dispenser 60. The outlet or spigot 17 contains a suitable valve and control handle for activating discharge of the use solution 44. In the preferred embodiment, the diluted solution is dispensed at a rate of approximately two gallons per minute.

The front end 50 of the storage container 11a preferably includes a handle 18 which allows the storage container 11a to be easily transported when either empty or filled. This is advantageous if the janitorial personnel wish to take the storage container 11a to a point of usage. In addition, a vent system (not shown), open to the atmosphere, may also be provided on use container 11a.

The storage container 11a also includes a cap assembly 19 at its front end toward the upper part of the container. The cap assembly 19 preferably includes a threaded, annular ring 20 which attaches to the storage container 11a. A gasket (not shown) is preferably provided to prevent leakage. The cap assembly 19 has two apertures or ports 21, 22 which accommodate the two connection fittings for the inlet lines 14a, 16a. It is to be understood that more than two inlet ports could be provided in the cap assembly 19 or storage container 11a, if it were desired that more than two inlet lines were necessary. That is, it is within the scope of the invention to fill the use container 11a with more than one concentrated solution. With this design, an additional orifice or port would be

provided for the additional product pick-up tube, and the aspirator design would be varied as necessary.

The internal means for proportioning the concentrate and water is illustrated by the cutaway portion of the container 11a shown in Fig. 3. Preferably, the proportioning means comprises an aspirator 26 which is built into the storage container 11a. In the preferred embodiment, the storage container 11a and aspirator assembly 26 are made from a suitable plastic material such as high density polyethylene. The aspirator can be manufactured as an insert to fit within the container as illustrated in Fig. 3. Alternatively, the aspirator 26 can be mounted within the container 11a by suitable means such as spin welding or use of an adhesive, or the container assembly 11a can be blow-molded around the aspirator assembly 26.

The aspirator operates so that when a source of detergent concentrate is connected to the vacuum inlet of the aspirator 26, the container 11a is filled with a diluted detergent 44. The vacuum created by water from line 16a flowing through the aspirator is utilized to withdraw the proper proportion of concentrated cleaning solution from its container 13a (Fig. 2). In this manner, the water and concentrate enter the container 11a simultaneously, as illustrated by the arrows in Fig. 3. Water passes through the aspirator 26, and the aspirator's output fills the product use container 11a.

An alternative proportioning means other than the aspirator 26 can be utilized. For example, an electric or mechanical pump could be employed to provide the proper proportions.

Within the container 11a are a water tube 52 and a concentrate tube 53, both tubes leading into the aspirator 26. The aspirator is in fluid communication with a discharge tube 27. The discharge tube 27 extends proximate the bottom of the container 11a. This allows

for underwater dispensing to minimize foaming. Preferably, the walls of the container 11a are translucent or clear so that the user can see how much solution 44 is in the container 11a.

The blend ratio, or proportion of chemical to water, is set by flow metering means, such as interchangeable metering tips (not shown) in aspirator 26. Each metering tip may be sized and configured to correspond to a particular proportion ratio. Different dilution ratios are sometimes needed for different applications, e.g., one application might require a 1% solution, whereas another application may require a 10% solution of the same product. Alternatively, an adjustable metering screw may be utilized to enable the proportion ratio to be adjusted.

In the preferred embodiment, the product pick-up tubes 14a-d are approximately 3/8 inch in diameter. These dimensions allow for adequate aspirator efficiency, and a larger tube diameter would allow for a longer pick-up tube to be utilized.

The pick-up tubing 14a-d is preferably transparent or translucent, so that the user can verify when it is filled with concentrate. It is desirable for the pick-up tube 14a-d to be completely filled and not contain air.

The upper end of the pick-up tube 14a-d preferably has an integrated check valve 31. An additional check valve, such as an umbrella check valve, may also be included in the lower end of the tube. In this manner, the pick-up tube 14a-d is completely closed by having a valve at each end. This allows the pick-up tube 14a-d to be disconnected without any spillage.

A quick connect assembly is provided at each end of the pick-up tube 14a-d to facilitate such connection and disconnection. One quick-connect assembly is utilized in the preferred embodiment to interconnect the pick-up tube 14a-d and water supply tube 16a-d with the inlet

ports 21, 22 in the cap assembly 19 of each container 11a-d.

Returning to Fig. 2, containers 11a-d are connected to lines 16a-d which are routed from dispenser 60, which is shown disposed on the top of rack 12. It will be appreciated that dispenser 60 may be disposed anywhere on rack 12. Furthermore, it will be appreciated that dispenser 60 may be provided as a separate unit, and further with each storage container being provided on a separate assembly. Other physical configurations of the preferred solution storage and dispensing apparatus will be appreciated by one of ordinary skill in the art.

A preferred dispenser 60 is shown in greater detail in Fig. 4. The components of dispenser 60 are preferably mounted in a housing 61 (shown in phantom) which is provided primarily for decorative purposes. It will be appreciated that a wide variety of materials and designs may be provided for housing 61.

As shown in Fig. 4, control valve 62 is preferably a mechanically-actuated permanent magnet solenoid valve, such as the No. 442 valve manufactured by Dema Engineering of St. Louis, Missouri. In this type of valve, a permanent magnet 64a is biased by a spring 64b to pull a plunger (not shown) inside of tube 64c to open a diaphragm (not shown), thus allowing the flow of water from input line 70 through control valve 62. Control valve 62 is opened by depressing push button 63, which axially displaces magnet 64a. The plunger disposed inside tube 64c is attracted to permanent magnet 64a, and consequently, when magnet 64a is displaced inwardly, the plunger is displaced outwardly to unseat the diaphragm, thereby opening control valve 62. Control valve 62 is returned to a closed configuration by releasing push button 63, which returns magnet 64a to its outer position, thereby drawing the plunger inward and reseating the diaphragm.

Any number of mechanically or electrically-actuated valves may be used as an alternative to control valve 62. However, it has been found that control valve 62 is simple, inexpensive, and reliable, and further does not require an electrical connection for its operation. Therefore, this valve is particularly suited to low cost portable stand alone applications since no separate power source is required.

Control valve 62 is connected by line 65 to a vacuum breaker 66 which provides back flow prevention as is required by many plumbing codes. Vacuum breaker 66 is preferably an atmospheric vacuum breaker such as a Watts No. 288A vacuum breaker manufactured by Watts Regulator. It has been found that this type of vacuum breaker must be placed downstream of the control valve to ensure proper operation. However, various other backflow preventers are also known in the art, many of which may be used upstream or downstream of control valve 62.

Vacuum breaker 66 is connected by line 67 to an input port of selector valve 68. Selector valve 68 also includes four outputs which are connected to lines 16a-d, to place the four outputs in fluid communication with containers 11a-d.

Selector valve 68 is preferably a rotary diverter valve which is actuated by knob 69, such as a PSV 14-5 5-way valve manufactured by Conant Inc. However, other mechanical and/or electric selector valves, and means for actuating them, are also known in the art. By rotating knob 69, various positions may be selected to place the input port of selector valve 68 in fluid communication with one of its outputs, thereby selecting the storage container to be filled which is in fluid communication with the selected output of the selector valve. Also, as discussed above, greater or lesser numbers of outputs, as well as outputs which are connected directly to discharge ports may be provided.

It will be appreciated that various known configurations of fittings, pipes, and brackets may be used to interconnect the components of dispenser 60 in the manner disclosed herein.

Various modifications may be made to the preferred embodiment without departing from the spirit and scope of the invention. For example, various degrees of electronic control may be provided to increase the sophistication of the solution storage and dispensing apparatus 10. For example, as shown in Fig. 1, an electronic controller 75 may optionally be provided to control the actuation of control valve 62. This could allow for a timing operation whereby depression of push button 63 would actuate the control valve 62 for a fixed or predetermined period of time, thus providing a metered quantity of solution. This timer function could also be provided by any of a number of known mechanical means as well. In addition, the electronic control could be used to track the quantity of solution which has been dispensed by the apparatus, which may be useful for inventory control.

Furthermore, float switches may be provided in the individual storage containers 11a-d such that control valve 62 may be automatically shut off when the volume of solution in the respective containers exceeds a predetermined level. This would prevent overfilling of the containers, as well as provide for a substantially automatic filling operation that is actuated merely by initially actuating the control valve. Other types of controls which may be provided by electronic controllers may also be used consistent with the invention.

Therefore, it will be appreciated that the present invention provides many significant advantages in providing a solution storage and dispensing apparatus which is less complex, less costly, and more reliable than many conventional systems. The above discussion, examples and embodiments illustrate our current

understanding of the invention. However, one skilled in the art will appreciate that various additional changes and modifications may be made within the scope of the invention. Thus the invention resides solely in the claims hereafter appended.

We claim:

1. A solution storage and dispensing apparatus, comprising:

(a) first and second containers, each having first and second inlet ports for receiving first and second liquids from first and second liquid sources, respectively, the first and second inlet ports being in fluid communication with a proportioning means, outletting into the container, for proportioning the relative flow rates through the first and second inlet ports;

(b) a selector valve having an input and first and second outputs, the first and second outputs in fluid communication with the first inlet ports of the first and second containers, respectively, wherein the selector valve is selectable between first and second positions for placing the input in fluid communication with the first and second outputs, respectively; and

(c) a control valve, in fluid communication with the first liquid source, for selectively controlling the flow of the first liquid to the selector valve.

2. The apparatus of claim 1, wherein the proportioning means of each container comprises an aspirator disposed within the container for drawing the second liquid into the container responsive to the flow of the first liquid into the container to form a solution comprising the first and second liquids.

3. The apparatus of claim 2, wherein the proportioning means of each container further comprises a metering tip for proportioning the relative flow rates through the first and second inlet ports to control the concentration of the solution.

4. The apparatus of claim 2, wherein the proportioning means of each container further comprises a flexible discharge tube for outletting the first and second liquids into the container.

5. The apparatus of claim 1, wherein the selector valve comprises a rotary diverter valve.

6. The apparatus of claim 5, wherein the selector valve has a third output and is further selectable to a third position for placing the input in fluid communication with the third output, the third output in fluid communication with a discharge port.

7. The apparatus of claim 1, further comprising a backflow preventer in fluid communication between the source of first liquid and the selector valve.

8. The apparatus of claim 7, wherein the backflow preventer comprises an atmospheric vacuum breaker coupled between the control valve and the selector valve.

9. The apparatus of claim 1, wherein the control valve comprises a mechanically-actuated permanent magnet solenoid valve.

10. The apparatus of claim 1, further comprising a controller for actuating the control valve, the controller including timing means for actuating the control valve for a predetermined period of time.

11. The apparatus of claim 1, wherein each container further comprises a float switch for shutting off the control valve when the volume of liquids in the container exceeds a predetermined level.

12. The apparatus of claim 1, wherein the first liquid is water and the second liquid is a chemical concentrate.

13. The apparatus of claim 12, wherein the apparatus is disposed on a portable stand alone cart having a single external connection which connects the control valve to a water supply.

14. A method for filling containers, comprising the steps of:

(a) providing a plurality of containers, each having first and second inlet ports for receiving first and second liquids from first and second liquid sources, respectively, the first and second inlet ports being in fluid communication with a proportioning means, outletting into the container, for proportioning the relative flow rates through the first and second inlet ports;

(b) selecting one of the containers to fill by selecting one of a plurality of positions of a selector valve having an input and a plurality of outputs, at least a portion of which are in fluid communication with the first inlet ports of the containers; whereby the input to the selector valve is placed in fluid communication with the selected container when the selector valve is in the selected position; and

(c) actuating a control valve disposed in fluid communication between the first liquid source and the input of the selector valve to dispense the first fluid through the selector valve, and thereby dispense the first and second fluids into the selected container.

15. The method of claim 14, wherein the proportioning means of each container comprises an

aspirator disposed within the container for drawing the second liquid into the container responsive to the flow of the first liquid into the container to form a solution comprising the first and second liquids.

16. The method of claim 14, further comprising the step of outletting the solution into a use container through a spigot in the selected container.

17. The method of claim 16, further comprising the step of, after the actuating step, filling a second container by selecting the selector valve position corresponding to the second container and actuating the control valve to dispense the first and second fluids into the second container.

18. An apparatus for dispensing a first liquid from a first liquid source to one of a plurality of containers, each container of the type for storing a solution comprising the first liquid and a second liquid from a second liquid source, and each container having first and second inlet ports for receiving the first and second liquids, respectively, the device comprising:

(a) a selector valve having an input and a plurality of outputs, each output in fluid communication with the first inlet port of one of the containers, wherein the selector valve is selectable between a plurality of positions to select one of the containers to fill, each position placing the input in fluid communication with one of the outputs; and

(b) a control valve, in fluid communication with the first liquid source, for selectively controlling the flow of the first liquid from the first liquid source to the selector valve; whereby when the control valve is actuated, the first liquid is directed to the selected container to mix

with the second liquid and form a solution in the container.

19. The apparatus of claim 18, wherein the selector valve comprises a rotary diverter valve.

20. The apparatus of claim 19, wherein the selector valve has an additional output and is further selectable to an additional position for placing the input in fluid communication with the additional output, the additional output in fluid communication with a discharge port.

21. The apparatus of claim 18, further comprising a vacuum breaker coupled between the control valve and the selector valve.

22. The apparatus of claim 18, wherein the control valve comprises a mechanically-actuated permanent magnet solenoid valve.

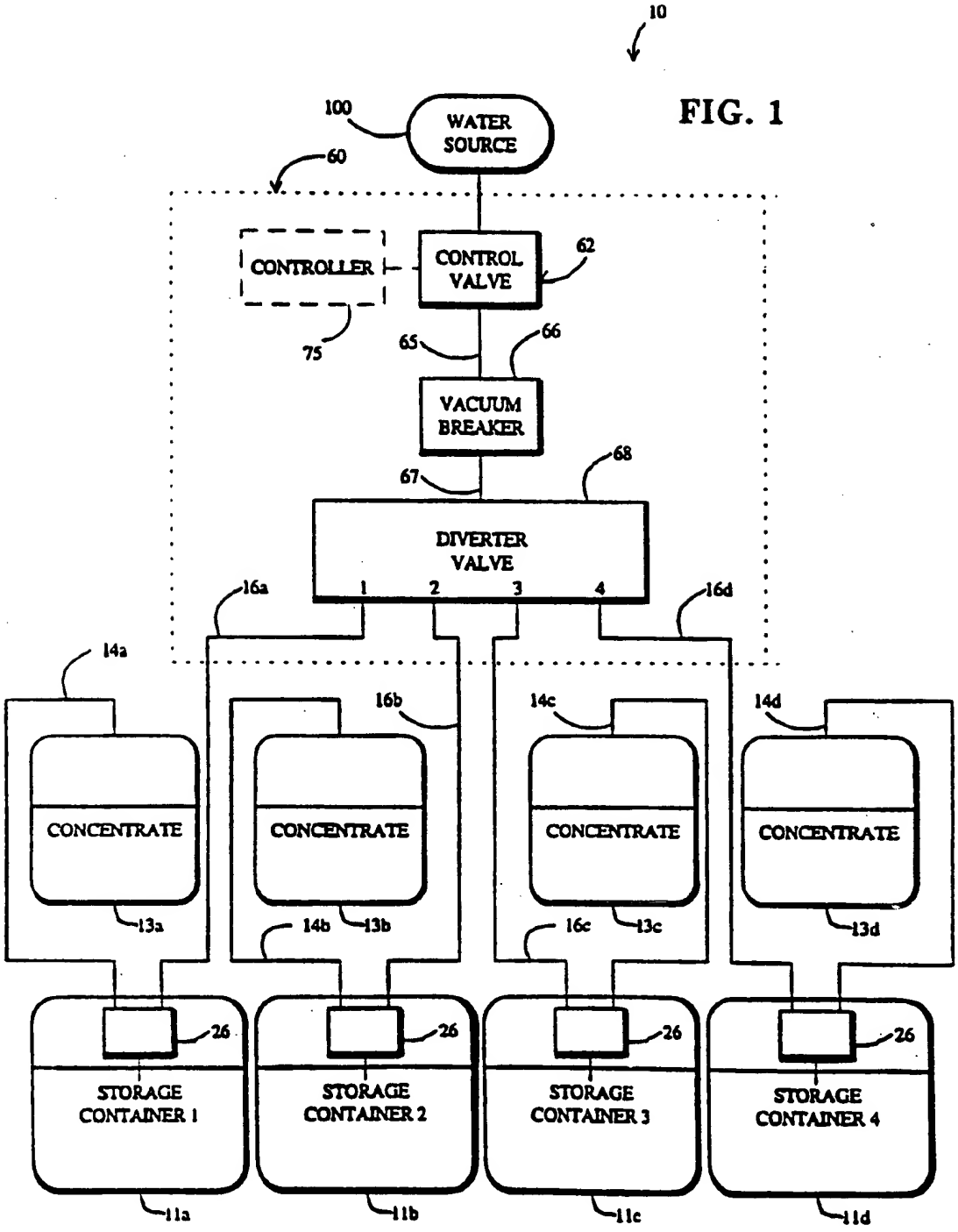

10
100
WATER SOURCE
60
CONTROLLER
CONTROL VALVE
62
75
65
66
VACUUM BREAKER
67
68
DIVERTER VALVE
1
2
3
4
16a
16d
14a
16b
14c
14d
CONCENTRATE
CONCENTRATE
CONCENTRATE
CONCENTRATE
13a
14b
13b
16c
13c
13d
26
26
26
26
STORAGE CONTAINER 1
STORAGE CONTAINER 2
STORAGE CONTAINER 3
STORAGE CONTAINER 4
11a
11b
11c
11d

FIG. 1

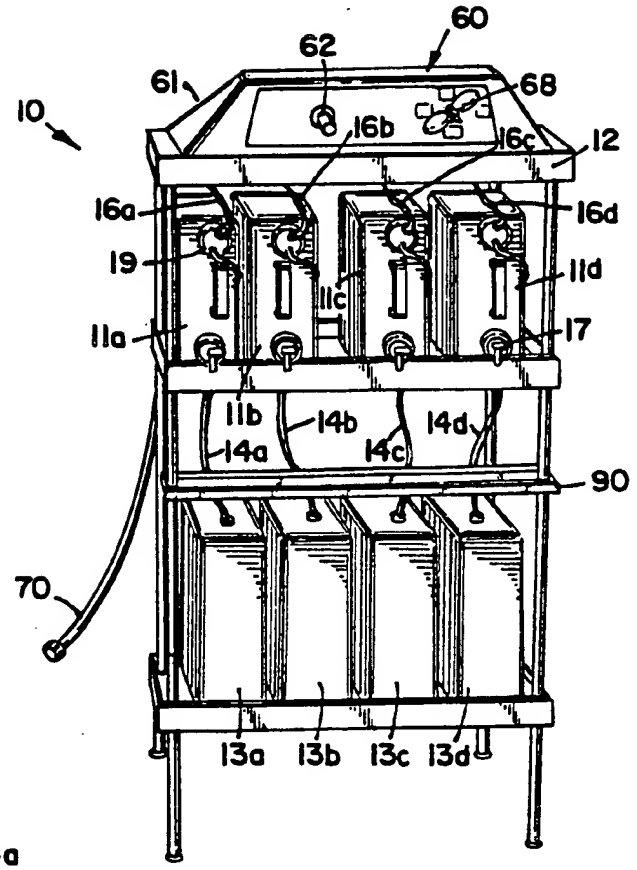

60
62
61
68
10
16b
16c
12
16a
16d
19
11d
11c
11a
17
11b
14b
14d
14a
14c
90
70
13a
13b
13c
13d

FIG.2

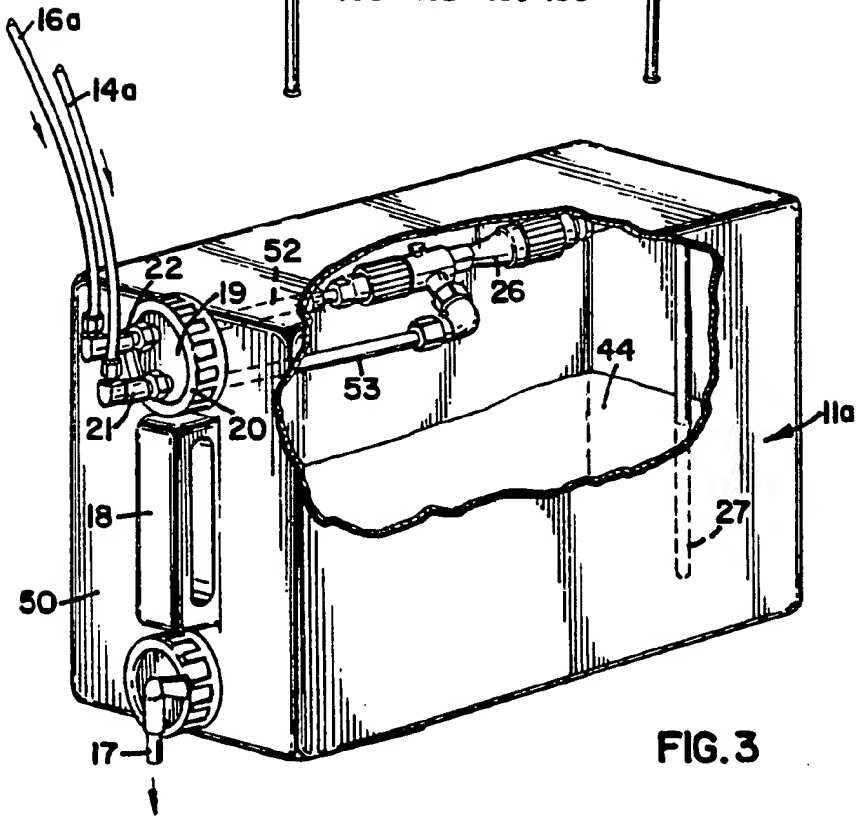

16a
14a
22
52
19
26
44
53
11a
21
20
18
27
50
17

FIG.3

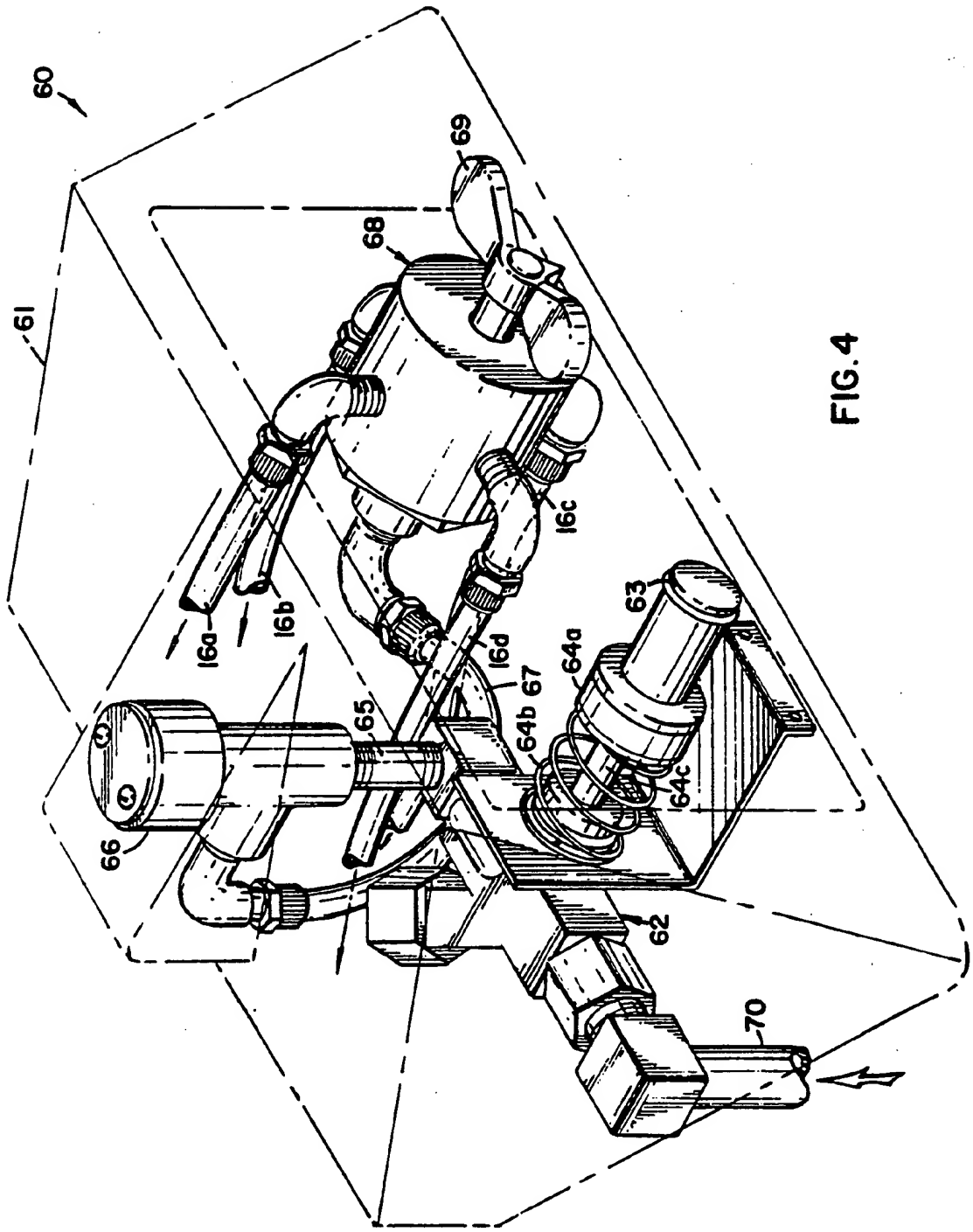


FIG.4

INTERNATIONAL SEARCH REPORT

Interr ul Application No
PCT/US 95/05932

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,5 255 820 (THOMAS) 26 October 1993 cited in the application see abstract; figure 1	1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Interna al Application No
PCT/US 95/05932

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B67D5/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B67D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	GB,A,555 875 (EVANS) 10 September 1943 see page 5, line 120 - line 126; figure 2	18,19 1-5,7,8, 12-17
Y	US,A,5 033 649 (COPELAND ET AL.) 23 July 1991 cited in the application see column 3, line 3 - line 9 see column 5, line 62 - column 6, line 4; figure 1	1-5,7,8, 12-17
A	EP,A,0 467 513 (SCOTT PAPER COMPANY) 22 January 1992 see column 2, line 1 - line 4	1,9
A	EP,A,0 544 072 (KAJ CHEMICAL RESEARCH AG) 2 June 1993 see abstract; figure	1

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 August 1995	09. 08. 95

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Martínez Navarro, A.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Inter ...al Application No
PCT/US 95/05932

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A-555875		NONE	
US-A-5033649	23-07-91	AU-B- 660274	22-06-95
		AU-A- 7146891	21-10-91
		EP-A- 0551254	21-07-93
		WO-A- 9114647	03-10-91
EP-A-0467513	22-01-92	US-A- 5037003	06-08-91
		AU-B- 651598	28-07-94
		AU-A- 7943691	30-01-92
		CA-A- 2042758	18-01-92
		DE-D- 69103234	08-09-94
		DE-T- 69103234	24-11-94
		ES-T- 2061183	01-12-94
		JP-A- 6080197	22-03-94
		US-A- 5083677	28-01-92
		US-A- 5228598	20-07-93
EP-A-0544072	02-06-93	DE-U- 9114044	02-01-92
US-A-5255820	26-10-93	AU-B- 654020	20-10-94
		AU-A- 2014792	21-12-92
		CA-A- 2107112	27-10-92
		EP-A- 0581876	09-02-94
		JP-T- 6507118	11-08-94
		NZ-A- 242463	25-11-94
		WO-A- 9219530	12-11-92